

### Claims

- 5 1. Use of a DG119-1 product and/or a DG119-1 agonist and/or of a DG119-2 antagonist for the manufacture of a medicament to stimulate and/or induce the differentiation or development of insulin producing cells from progenitor cells.
- 10 2. The use of claim 1, wherein the progenitor cells are stem cells.
3. The use of claim 1, wherein the stem cells are embryonic or somatic stem cells.
- 15 4. The use of any one of claims 1-3, wherein the stem cells are of mammalian origin, preferably of human origin with the proviso that the use of human embryos is excluded.
- 20 5. The use of any one of claims 1-4, wherein the progenitor cells have been transfected with a pancreatic gene, particularly the Pax4 gene.
6. Use of a DG119-1 product and/or a DG119-1 agonist and/or of a DG119-2 antagonist for the manufacture of a medicament to promote the protection survival and/or regeneration of insulin producing cells.
- 25 7. The use of claim 6, wherein the insulin producing cells are beta-cells.
8. The use of claim 6 or 7, wherein the insulin producing cells are of mammalian origin, preferably of human origin, with the proviso that the use of human embryos is excluded.
- 30 9. The use of any one of claims 6-8, wherein the insulin producing cells have been transfected or transduced with a pancreatic gene, particularly the Pax4 gene.

10. The use of any one of claims 1-9 for the prevention or treatment of a disease caused by, accompanied by or associated with impaired beta-cell function.

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11. The use of claim 10 for the treatment of beta-cell degeneration in patients suffering from diabetes type I, LADA, or progressed diabetes type II.

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12. The use of claim 10 for the prevention of beta-cell degeneration in patients at risk to develop beta-cell degeneration, like for example but not limited to patients suffering from diabetes type I or II, or LADA in early stages.

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13. The use of any one of claims 1-12, wherein the active ingredient is administered to a patient

(i) as a pharmaceutical composition e.g. enterally, parenterally or topically directly to the pancreas,

(ii) via implantation of active ingredient expressing cells,

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and/or

(iii) via gene therapy.

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14. The use of claim 13, wherein the active ingredient is administered in combination with another pharmaceutical composition useful to treat beta-cell degeneration, for example but not limited to hormones, growth factors, or immune modulating agents.

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15. The use of any one of claims 1-14, wherein the DG119-1 product is a protein including purified natural, synthetic or recombinant DG119-1 and variants thereof.

16. The use of claim 15 wherein variants are selected from insertion, substitution, deletion variants and/or chemically modified derivatives,

for example but not limited to hybrids of DG119-1 and other proteins.

- 5 17. The use of claim 15 or 16, wherein the DG119-1 product is selected from proteins or peptides substantially homologous to the human DG119-1 protein having the amino acid sequence published as GenBank Accession Number XP\_034000.
- 10 18. The use of any one of claims 1-17, wherein the DG119-1 product is a nucleic acid, e.g. RNA and/or DNA encoding a DG119-1 protein product.
- 15 19. The use of any one of claims 1-18, wherein the DG119-2 antagonist is selected from DG119-2 fragments, modified DG119-2 proteins, antibodies, and biologically active nucleic acids.
- 20 20. The use of any one of claims 1-19, wherein an effective amount of cells treated in vitro with the active ingredient are transplanted to a patient in need.
- 25 21. The use of any one of claims 1-20, comprising modifying DG119-1 and/or DG119-2 expression, wherein cells from a patient in need that have been modified to produce and secreted DG119-1 protein product and/or a DG119-1 agonist and/or a DG119-2 antagonist in vitro are re-implanted into the patient and/or wherein cells of a patient in need are modified to produce and secrete a DG119-1 protein product and/or a DG119-1 agonist and/or a DG119-2 antagonist in vivo.
- 30 22. The use of any one of claims 1-21 in combination with at least one other pharmaceutical agent.

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23. The use of claim 22 in combination with at least one other pharmaceutical agent suitable for the treatment or prevention of pancreatic diseases and/or obesity and/or metabolic syndrome.

5 24. The use of claim 23 in combination with at least one other pharmaceutical agent suitable for stimulating and/or inducing the differentiation or development of insulin producing cells from progenitor cells.

10 25. The use of claim 22 in combination with at least one other pharmaceutical agent which has an immunosuppressive activity.

15 26. A method for differentiating or regenerating cells into functional pancreatic cells, the method comprising: (a) cultivating cells capable of being differentiated or regenerated into pancreatic cells in the presence of an effective amount of a DG119-1 product and/or a DG119-1 agonist and/or a DG119-2 antagonist in vitro (b) allowing the cells to develop, to differentiate and/or to regenerate at least one pancreatic function; and (c) optionally preparing an effective amount of the differentiated or regenerated pancreatic cells for transplantation into a patient in need thereof.

20 27. The method of claim 26, wherein the patient in need is a human individual.

25 28. The method of claim 26 or 27, wherein the patient in need has (a) functionally impaired, (b) reduced numbers and/or (c) functionally impaired and reduced numbers of pancreatic cells.

30 29. The method of any one of claims 26-28, wherein said patient in need is a type I diabetic patient or type II diabetic patient or LADA patient.

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30. The method of any one of claims 26-29, wherein the pancreatic cells are insulin-producing cells.

5 31. The method of any one of claims 26-30, wherein the pancreatic cells are beta-cells of the pancreatic islets.

32. The method of any one of claims 26-31, wherein the cells in step (a) are selected from embryonic stem cells, adult stem cells, somatic stem cells or progenitor cells, preferably derived from pancreatic tissue.

10 33. The method of any one of claims 26-32, wherein the cells in step (a) are of mammalian origin, preferably human origin, with the proviso that the use of human embryos is excluded.

15 34. The method of any one of claims 26-33, wherein the cells in step (b) have at least one pancreatic function selected from insulin production in response to glucose and expression of glucagon.

20 35. A method for differentiating or regenerating cells into functional pancreatic cells, the method comprising: preparing an effective amount of a DG119-1 product or a DG119-1 agonist and/or a DG119-2 antagonist or of cells capable of expressing a DG119-1 product and/or a DG119-1 agonist and/or a DG119-2 antagonist for administration to a patient in need thereof.

25 36. The method of claim 35, wherein the active ingredient is a protein product.

30 37. The method of of claim 36, wherein the active ingredient is a nucleic acid.

38. The method of claim 37, wherein cells have been modified to produce and secrete a DG119-1 product and/or a DG119-1 agonist and/or a

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DG119-2 antagonist and are prepared for transplantation into a suitable location in the patient.

5 39. A cell preparation comprising functional pancreatic cells treated with an active ingredient selected from a DG119-1 product and/or a DG119-1 agonist and/or a DG119-2 antagonist obtainable by the method of any one of claims 26-34.

10 40. A cell preparation comprising cells expressing an active ingredient selected from a DG119-1 product and/or a DG119-1 agonist and/or a DG119-2 antagonist obtainable by the method of any one of claims 35-39.

15 41. The preparation of claim 39 or 40, which is a pharmaceutical composition.

42. The preparation of any one of claims 39-41 for the treatment or prevention of pancreatic diseases, particularly diabetes.

20 43. The preparation of any one of claims 39-42 for administration by transplantation or for use in a medical device.

44. The preparation of any one of claims 39-43, which contains pharmaceutically acceptable carriers, diluents, and/or additives.

25 45. The preparation of any one of claims 39-44, which is a diagnostic composition.

30 46. The preparation of any one of claims 39-45, which is a therapeutic composition.

47. The preparation of any one of claims 39-46 for the manufacture of an agent for the regeneration of pancreatic tissues or cells, particularly

pancreatic beta cells.

48. The preparation of any one of claims 39-47 for application in vivo.

5 49. The preparation of any one of claims 39-48 for application in vitro.

50. A method for identifying and/or characterizing compounds capable of modulating the differentiation or regeneration of cells into functional pancreatic, particularly insulin-producing cells comprising:

10 contacting a compound to be tested with cells under conditions wherein the cells are capable of being differentiated or regenerated into functional pancreatic cells in the presence of DG119-1, a DG119-1 agonist and/or a DG119-2 antagonist and determining the effect of the compound on the differentiation process.

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51. The method of claim 50 comprising transfecting the cells with a DNA construct containing a reporter gene under regulatory control of a gene involved in beta-cell differentiation, contacting said transfected cells with a compound to be tested and determining the activity of the reporter gene.

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52. A method for identifying and/or characterizing compounds capable of modulating the differentiation or regeneration of cells into functional pancreatic, particularly insulin-producing cells comprising:

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contacting a compound to be tested with cells under conditions wherein the cells are capable of being differentiated or regenerated into functional pancreatic cells and determining the effect of the compound on the expression of DG119-1 and/or DG119-2.

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53. Use of a preparation of cells expressing an active ingredient selected from a DG119-1 product and/or a DG119-1 agonist and/or a DG119-2 antagonist for the treatment and prevention of diabetes.

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54. The use of claim 53 for inducing the regeneration of pancreatic cells.

55. The use of claim 54, wherein pancreatic cells are beta-cells of the islets.

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56. Use of a preparation of cells treated with an active ingredient selected from a DG119-1 product and/or a DG119-1 agonist and/or a DG119-2 antagonist for the treatment and/or prevention of diabetes.

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57. The use of claim 56 wherein the cells are differentiated progenitor cells capable of insulin production.